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US005433992A

**United States Patent** [19]

Galda et al.

[11] **Patent Number:** **5,433,992**[45] **Date of Patent:** **Jul. 18, 1995**[54] **SEALING MEMBER FOR A CONTAINER**[75] **Inventors:** Michael P. Galda, Acton; Brian M. Klassen, Burlington; Stephen H. Witt, Smithville, all of Canada[73] **Assignee:** Stanpac Inc., Smithville, Canada[21] **Appl. No.:** 961,036[22] **Filed:** Oct. 14, 1992

3,389,827	6/1968	Abere et al.	220/53
3,391,847	7/1968	Christine et al.	220/359
3,489,307	1/1970	Wenger	215/40
3,501,042	3/1970	Risch et al.	215/40
3,549,440	12/1970	Adcock et al.	156/69
3,565,247	2/1971	Brochman	206/59
3,637,101	1/1972	Risch	215/40
3,763,845	6/1973	Dukess	428/64

(List continued on next page.)

**Related U.S. Application Data**

[63] Continuation of Ser. No. 530,536, May 30, 1990, abandoned, which is a continuation of Ser. No. 162,787, Mar. 2, 1988, Pat. No. 4,961,986.

[30] **Foreign Application Priority Data**

Sep. 9, 1987 [CA] Canada ..... 546450

[51] **Int. Cl.<sup>6</sup>** ..... C09J 7/02[52] **U.S. Cl.** ..... 428/201; 428/344;  
428/351; 428/354; 428/349; 215/232; 215/250;  
215/305; 215/350[58] **Field of Search** ..... 428/200, 201, 344, 351,  
428/354, 347, 349, 579, 582, 594; 156/291;  
215/232, 250, 305, 350; 427/208.2, 208.4, 208.8[56] **References Cited****U.S. PATENT DOCUMENTS**

713,824	11/1902	White	215/298
745,195	11/1903	Kimsey	
756,601	4/1904	Doremus	215/298
830,735	9/1906	Olsson	215/298
895,719	8/1908	Bradley	215/298
902,843	11/1908	Sheppard	215/298
1,073,071	9/1913	Hall	215/298
2,050,248	8/1936	Eisen	154/45.5
2,077,992	4/1937	Eisen	215/43
2,131,775	10/1938	Waring	212/250
2,188,940	2/1940	Gutmann	215/40
2,620,939	12/1952	Weisgerber	215/40
2,646,183	7/1953	Pellett	215/40
2,937,481	5/1960	Palmer	53/39
3,032,225	5/1962	Harding	215/250
3,202,308	8/1965	Botkin	215/40
3,317,068	5/1967	Betner	215/305
3,330,720	7/1967	Stevens et al.	161/62
3,362,004	1/1968	Grimes	215/40

**FOREIGN PATENT DOCUMENTS**

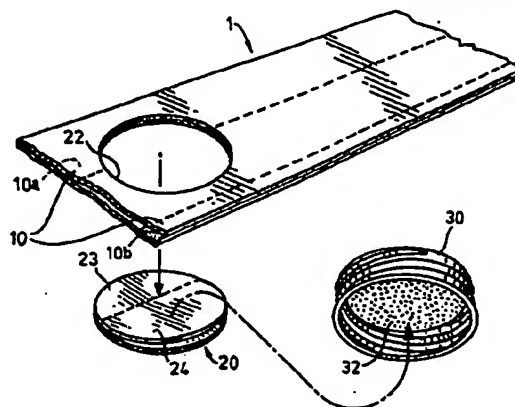
0040797A1	2/1981	European Pat. Off.	
0057436	11/1982	European Pat. Off.	
0109592	5/1984	European Pat. Off.	
0109593	5/1984	European Pat. Off.	
0111900A3	6/1984	European Pat. Off.	
0111900A2	6/1984	European Pat. Off.	
0128434A2	12/1984	European Pat. Off.	
0135431	3/1985	European Pat. Off.	
2327161	6/1977	France	
3212990	4/1981	Germany	
209616	7/1940	Switzerland	
565079	8/1975	Switzerland	
659633	2/1987	Switzerland	
2072131	9/1981	United Kingdom	

Primary Examiner—Jenna L. Davis

[57] **ABSTRACT**

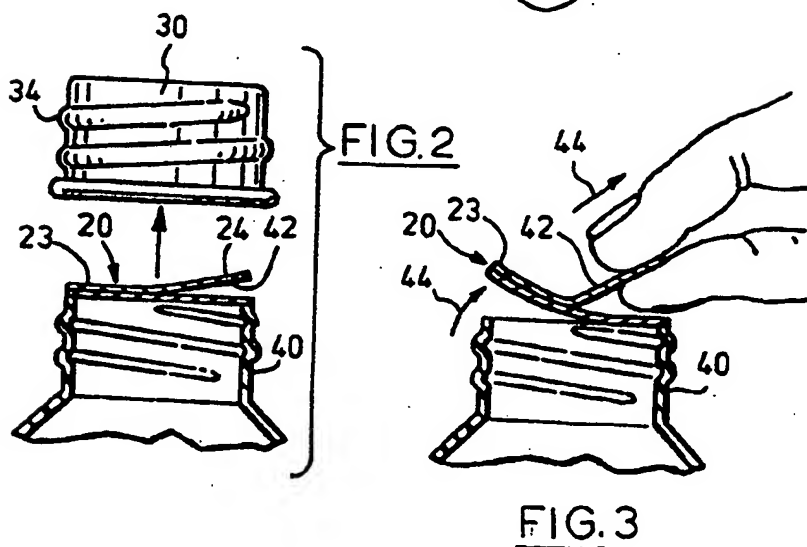
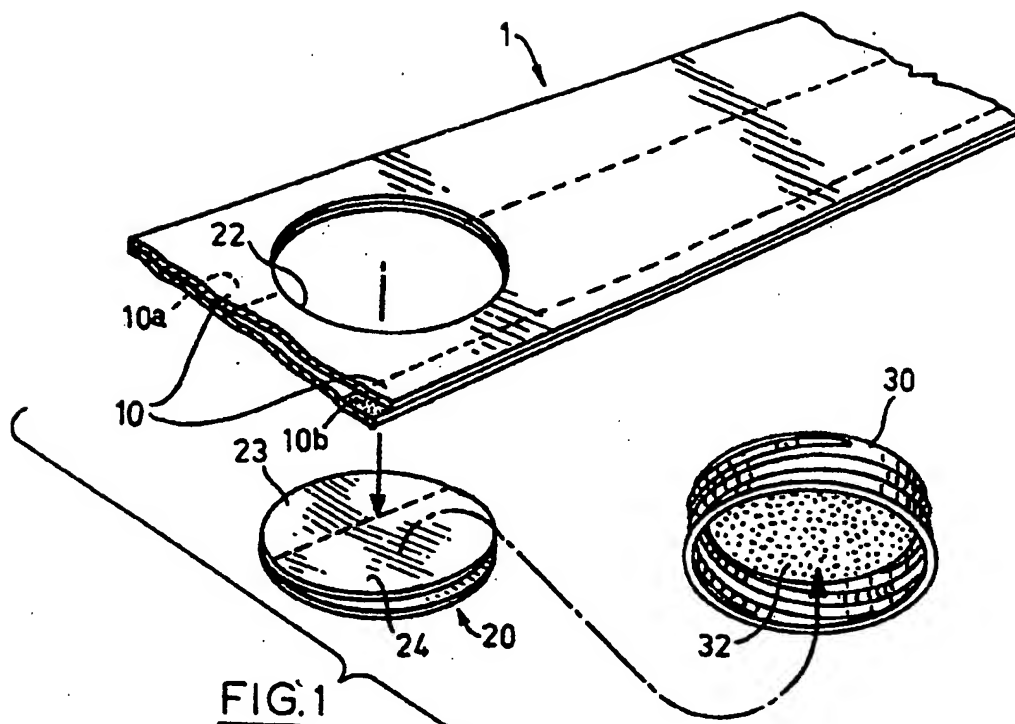
A sealing member for a container has a membrane, e.g. aluminum foil, and a first sheet, e.g. polyester, part of which is bonded to the membrane. The other part of the sheet is free, so as to form a tab, to enable the seal to be detached. The seal can be attached to the neck of a bottle by a hot melt adhesive. The sheet and membrane can be stamped from a compound sheet and be of the same size. The composite portion can extend up to a line extending across a major portion of the membrane, or in another embodiment it covers a major portion of the membrane. Alternatively, the first sheet and the membrane can have a substantially common periphery in the separated portion of the sealing member forming the tab. A further embodiment provides for a sealing member that is entirely planar.

29 Claims, 2 Drawing Sheets



## U.S. PATENT DOCUMENTS

3,900,125	8/1975	Wyler et al.	215/341	4,500,011	2/1985	Brochman	220/359
3,923,198	12/1975	Brochman	220/359	4,501,371	2/1985	Smalley	215/232
3,964,415	6/1976	Viker	113/121 C	4,514,248	4/1985	Cummings	156/268
3,990,603	11/1976	Brochman		4,527,703	7/1985	Cummings	215/232
4,044,941	8/1977	Knudsen	229/43	4,537,327	8/1985	Lu	220/359
4,108,330	8/1978	Patterson	220/260	4,557,505	12/1985	Schafer et al.	283/81
4,135,637	1/1979	Hannula	220/271	4,564,121	1/1986	Brochman	220/359
4,155,439	5/1979	Fletcher	198/339	4,565,738	1/1986	Purdy	428/349
4,163,506	8/1979	Patterson	220/260	4,576,297	3/1986	Larson	212/250
4,189,060	2/1980	Trottman, III	220/260	4,577,777	3/1986	Brochman	220/359
4,209,126	6/1980	Elias	229/43	4,579,240	4/1986	Ou-Yang	215/230
4,215,791	8/1980	Brochman	220/258	4,588,099	5/1986	Diez	215/232
4,256,528	3/1981	Patterson	156/514	4,588,465	5/1986	Paciorek	156/220
4,324,601	4/1982	Dembicki et al.	159/69	4,595,114	6/1986	Lu	220/260
4,328,905	5/1982	Hardt	220/258	4,595,434	6/1986	Eckstein et al.	156/69
4,372,460	2/1983	Brochman	220/258	4,596,338	6/1986	Yousif	215/232
4,373,978	2/1983	Patterson	159/69	4,625,875	12/1986	Carr	215/232
4,378,074	3/1983	Brochman	220/260	4,650,082	3/1987	Paciorek	215/230
4,390,552	6/1983	Niwa	426/126	4,666,052	5/1987	Ou-Yang	215/230
4,405,056	9/1983	Patterson	220/271	4,673,601	6/1987	Lamping et al.	428/35
4,418,834	12/1983	Helms et al.	220/359	4,684,554	8/1987	Ou-Yang	428/35
4,423,819	1/1984	Cummings	215/232	4,693,390	9/1987	Hekal	220/359
4,424,911	1/1984	Resnick	215/365	4,722,447	2/1988	Crisci	215/232
4,436,213	3/1984	Paul, Jr. et al.	215/365	4,733,786	3/1988	Emslander	215/230
4,442,129	4/1984	Niwa et al.	429/399	4,735,335	4/1988	Torterotot	220/270
4,445,620	5/1984	Brochman	220/271	4,754,890	7/1988	Ullman	215/232
4,448,326	5/1984	Brochman	220/270	4,757,914	7/1988	Roth	
4,452,842	6/1984	Borges et al.	428/195	4,762,246	8/1988	Ashley	220/270
4,454,956	6/1984	Patterson	220/214	4,767,016	8/1988	Cook, Jr. et al.	215/230
4,462,502	7/1984	Luenser	215/329	4,778,698	10/1988	Ou-Yang	428/35
				4,801,041	1/1989	Takata et al.	220/359
				4,810,541	3/1989	Newman	428/36.7



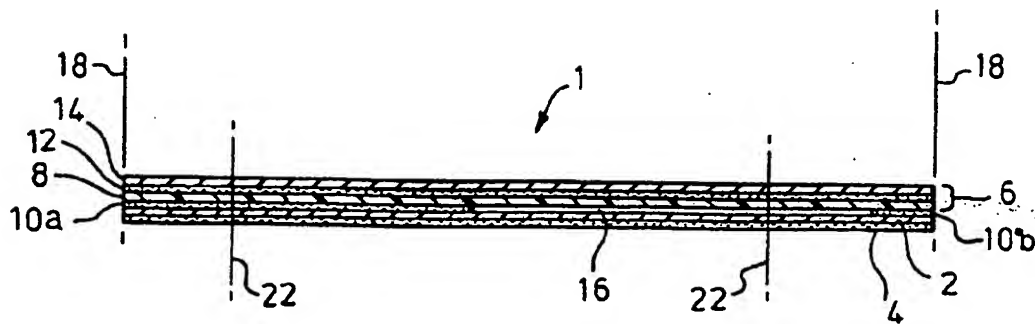


FIG. 4

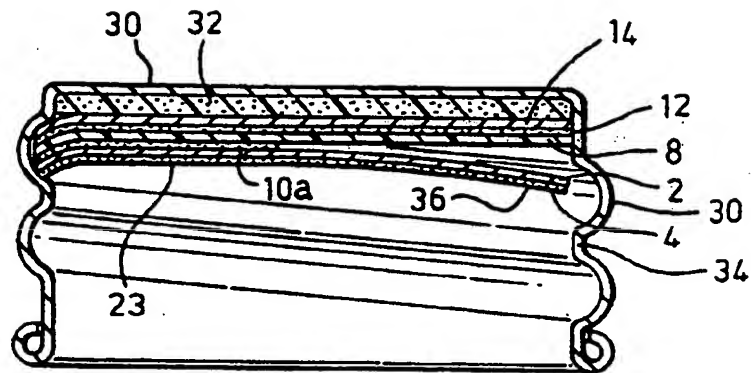


FIG. 5

## SEALING MEMBER FOR A CONTAINER

This application is a continuation of application Ser. No. 07/530,536 filed on May 30, 1990, now abandoned which is a Continuation of application Ser. No. 07/162,787 filed on Mar. 2, 1988, now U.S. Pat. No. 4,961,986.

## FIELD OF THE INVENTION

This invention relates to a sealing member or closure for a container, and more particularly is concerned with a sealing member that includes a tab to facilitate removal of the sealing member.

## BACKGROUND OF THE INVENTION

There are known for a wide variety of containers, various seals or closures which are sealed to the container around an opening to close the opening. To open the container, the seal has to be broken, providing an indication that the container has been opened, or possibly tampered with. Such seals or closures are used in a wide variety of containers, e.g. bottles of pharmaceuticals, foods, beverages, etc. In some cases their primary function is to provide an element of security, and an indication if the contents have been tampered with. For foods, they are frequently used to seal the foods, so as to maintain the freshness of the food and prevent contamination of the food.

The following U.S. patents all relate in general terms to seals for containers, and were considered during the preparation of this application.

U.S. Pat. Nos. 713,824 (White) 745,195 (Kimsey) 756,601 (Doremus) 830,735 (Olsson) 895,719 (Bradley) 902,843 (Sheppard) 1,073,071 (Hall) 2,937,481 (Palmer) 3,032,225 (Harding) 3,317,068 (Betner) 3,632,004 (Grimes) 3,900,125 (Wylar) 4,044,941 (Knudsen) 4,155,439 (Fletcher et al) 4,324,601 (Dembicki) 4,423,819 (Cummings) 4,442,129 (Niwa) 4,462,502 (Luenser) 4,469,754 (Hoh et al) 4,501,371 (Smalley) 4,514,248 (Cummings) 4,526,562 (Knudsen et al) 4,527,703 (Cummings) 4,576,297 (Larson) 4,579,240 (Ou-Yang) 4,588,099 (Diez) 4,625,875 (Carr) 4,666,052 (OU-Yang)

The seven earlier patents all relate generally to closures for bottles or containers including a shoulder or annular recess for a disk or card closure or the like, and many of them are particularly concerned with milk bottles. Some of these patents show tabs for assisting removal of the closure, but in general the structures are not suitable for simple, economical mass production, and they are not concerned with seals that can be bonded to the neck of a bottle.

In the White patent, a strip is secured to the disk closure by paste and its ends form tabs for removal of it.

U.S. Pat. No. 745,195 discloses a closure provided with an upper disk secured to the main disk and having a segment removed so it can be grasped. The drawings show a staple securing the two parts together.

U.S. Pat. No. 756,601 forms a tab by folding a single sheet of a certain shape.

In U.S. Pat. No. 830,735, there is disclosed a closure in which an upper disk is mounted over a lower disk and is larger. Whilst it is suggested that any suitable fastening could be employed, only shellac or a staple are disclosed.

U.S. Pat. No. 895,719 discloses a bottle or jar closure including a liftable pull tab in the centre of the disk.

U.S. Pat. No. 902,843 is concerned with a disk provided with a thread for lifting the closure.

The Hall patent again discloses a milk bottle seal, which includes a central flap for lifting the seal. A disadvantage with such an arrangement is the difficulty of bonding the two layers together whilst leaving the flap free.

The Palmer U.S. Pat. No. 2,937,418 is of some interest, as apparently being an early example of induction sealing of the closure to the neck of a bottle. However, it does not address the problem of providing any tab or the like to facilitate removal of the seal.

The Harding U.S. Pat. No. 3,032,225 discloses a combination closure which includes a tear-off cap. This is formed from thin aluminium and includes a tear-off tongue. No discussion is given as to how this would be formed. Experience with such tear-off tongues or tabs for aluminium foil closures indicates that they frequently do not function as intended. Often, instead of enabling the whole closure to be removed, a thin strip is torn from the middle of the closure.

The Bether U.S. Pat. No. 3,317,068 is concerned with tear-open sealed containers, and includes a multi-layer closure with a central pull tab.

The Grimes U.S. Pat. No. 3,632,004 tackles the problem of facilitating the removal of the closure or seal in a different manner. Here, a recess or notch is provided in the neck of the bottle, so that a portion of the closure overhangs it. This does not greatly facilitate removal of the closure. The user has to grasp a relatively small edge portion of the closure, and this is not practical for thin flexible seals. However, the notch is relatively small in width, so that again there is the potential for a foil seal to be torn, rather than removed as a whole.

The Wylar patent discloses a container for a pharmaceutical or cosmetic product with a foil closing the opening. This includes a tear-off flap. However, no great details are given as to how this would be formed.

The Carr et al U.S. Pat. No. 4,625,875 is primarily concerned with a tamper-evident closure. It does show a foil disk provided with a tab. This tab has to be folded over within the cap. No details are given as to how this would be formed or assembled.

The Fletcher et al U.S. Pat. No. 4,159,439 should also be noted. This is the only patent that discusses in detail the production of a flexible end closure with a folded pull tab. As shown in this patent, complex machinery is required to form the closure and fit it to the container. A circular table or platform is provided, on which the containers are placed. The table is then rotated, to move each container through numerous different stations. At each station a different operation is performed. The closure itself is stamped from a strip of foil, and then the tab has to be folded up on top of the main portion of it. A complex sequence is required to mount the closure to the container. To set up such machinery for a particular production run is time consuming and expensive.

Additional problems are encountered with this sort of technique. Firstly, the presence of the inwardly folded tab can affect the sealing by means of induction heating. Induction heating relies upon the generation of currents and hence heat in the foil. The presence of the tab affects the electrical properties locally, and can result in improper sealing. As discussed in an article by Bill Zito in the August, 1986 issue of Food and Drug Packaging, the current tends to follow the actual periphery of the

tab. Also, the folded tab can stick to the inside of the cap, which then requires a silicone liner or the like. Additionally, the induction sealing technique relies upon the fact that the foil closure is pressed against the neck of the container by the cap. With the folded tab present, there may not be even pressure applied to the foil closure, which again can result in imperfect sealing.

Even if proper sealing is achieved, the tab itself often does not provide for reliable opening of the container. Ideally, the tab and the whole circular foil closure should be removable as one piece. In practice, when the tab is lifted to detach the foil from the bottle or container neck, only the portion of the foil adjacent to the tab becomes detached from the container. Then, the tab simply pulls away a strip of foil across the container. This then leaves the user to manually remove the remaining pieces of the foil. For many uses, it is quite undesirable for the user to have to insert his or her fingers into the neck of the container, as this can result in contamination. Such uses could be pharmaceutical products, and food and beverages dispensed at restaurants.

As suggested by the Fletcher et al patent and many other earlier proposals, a common technique for sealing a foil to the neck of a container is by induction heating. This requires the foil sealing member or closure to be inserted into a cap. The cap is then fitted, usually by screwing onto the neck of the container, so as to press the foil against the neck of the container. The neck of the container is then passed through an induction heater, which induces currents in the foil, melting an appropriate adhesive on the foil, causing it to bond to the neck of the bottle. One step in this process is the fitting of the foil into the cap, and the subsequent fitting of the cap to the neck of the container. For this purpose, the foil closure by itself must be capable of being retained within the cap. For simple aluminium foil sealing members or closures this does not always work perfectly. Aluminium has plastic characteristics; in other words, when the foil is pressed into a screw cap, the edges of the foil can deflect permanently as they pass over the screw threads. The edges of the foil do not snap-back into the grooves of the screw thread. Consequently, the foil can drop out before the cap is fitted to the container neck.

Accordingly, what is desired is a sealing member or closure which can be readily fitted to the neck of a container. It should be capable of being produced simply and economically on conventional machinery, without numerous complex forming operations. Ideally, it should be of uniform thickness throughout, and should be capable of uniform induction heating, so that it can be readily joined to the neck of a bottle by induction heating. Further, it is desirable that at least one edge portion should include elastic, as opposed to plastic properties, so that when inserted into a cap, it will snap-back into the grooves of the screw thread of the cap to retain the sealing member in position prior to induction heating and bonding.

#### BRIEF SUMMARY OF THE PRESENT INVENTION

In accordance with the present invention, there is provided a sealing member, adapted for securing to and closing an opening of a container to close the container, the sealing member comprising: a membrane having a periphery, one side of which is for bonding to the lip of a container; a first sheet; a first layer of adhesive be-

tween the membrane and the sheet bonding facing portions of the membrane and the first sheet together to form a composite portion whilst leaving at least one portion of the first sheet free in a separated portion of the sealing member, the free portion of the first sheet forming a tab; and an additional layer of adhesive on said one side of the membrane which is adapted for bonding to the lip of the container, with the first layer of adhesive bonding the first sheet and the membrane together so strongly that, in use, the first sheet and the membrane can be removed as a unit from the lip of the container, to open the container.

In accordance with the present invention, the first sheet and the membrane have a variety of additional characteristics, provided singularly or in combination. Thus, the composite portion can extend up to a line extending across a major portion of the membrane. Alternatively, the first sheet and the membrane have a substantially common periphery in the separated portion of the sealing member forming the tab. In another variant, the composite portion covers a large portion of the membrane. In yet another variant, the sealing member is generally planar.

The sealing member may have the first layer of adhesive extending between opposite parts of the periphery of the membrane and up to a line extending across the membrane between ends of said opposite peripheral parts, the line separating the composite portion from a separated portion including a free tab. Also, a second sheet can be provided, secured to the first sheet by a further layer of adhesive to reinforce the first sheet. These features, may be provided in various combinations.

In a preferred form of the invention, the sheet is bonded to the membrane across all of one side of the sheet up to the line, whilst the other side of the sheet forms a single tab. However, it is possible for the bonded portion of the sheet to be a central strip of the sheet, with a line on either side, so as to leave tabs on either side thereof.

The surface of the membrane remote from the first sheet is coated with a layer of an adhesive. The term "adhesive" is used in the specification including the claims to mean any adhesive capable of bonding the membrane to the neck of a container, and includes thermoplastics and pressure-sensitive adhesives. Preferably, the adhesive is a hot melt bonding material, and in the specification including the claims, a "hot melt bonding material" means a material which upon heating, for example as a result of induction heating of a metal membrane, melts, to enable the membrane to be bonded to the lip or neck of a container, and encompasses both thermoplastic materials and adhesives.

The present invention also provides a cap in combination with a sealing member as just defined.

#### DESCRIPTION OF THE DRAWING FIGURES

For a better understanding of the present invention and to show more clearly how it may be carried into effect, reference will now be made, by way of example, to the accompanying drawings, which show a preferred embodiment of the present invention, and in which:

FIG. 1 is a perspective view of an elongate strip according to the present invention, showing a sealing member stamped from the strip and a corresponding cap;

FIG. 2 is a side view showing a section through the neck of a container including a sealing member according to the present invention, and a cap shown removed;

FIG. 3 is a sectional view of the neck of the container of FIG. 2, showing removal of the sealing member;

FIG. 4 is a sectional view perpendicular to the axis of the elongate strip of FIG. 1; and

FIG. 5 is a sectional view through a cap fitted with a sealing member of the present invention.

#### DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference to FIGS. 1 and 4, an elongate strip according to the present invention is designated by the numeral 1. As described in greater detail below, the elongate strip 1 can be of indefinite length, and can form part of a wider strip.

The elongate strip 1 has a membrane 2. A lower surface of the membrane 2 is coated with a hot melt bonding material or adhesive 4. A sheet 6 is a laminate sheet comprising a number of separate layers. The sheet 6 has a first sheet 8. Between the first sheet 8 and membrane 2, there is a first layer of adhesive 10. This layer of adhesive 10 does not extend across the full width of the strip 1, as detailed below.

A further layer of adhesive 12 is provided on top of the first sheet 8 and bonds a second sheet 14 to the first sheet 8.

The section through the elongate strip 1, shown in FIG. 4, is constant along its length (for clarity, the thickness of the various layers is amplified in FIG. 4). The first layer of adhesive 10 comprises two portions. A major portion, designated 10a extends along the left hand side of the strip as viewed in FIG. 4. A narrow portion 10b can extend along the right hand side of the strip 1, again as viewed in FIG. 4. This leaves a gap 16, where the membrane 2 and first sheet 8 are not bonded to one another.

In practice, the elongate strip 1 would be produced as part of a wider strip containing a number of the elongate strips 1. The edges of the elongate strip 1 are defined by the boundaries 18 in FIG. 4, and in the wider strip the elongate strips 1 would be continuous at their boundaries 18. Thus, the wide portion 10a would be continuous with the narrow portion 10b of an adjacent strip. Appropriate edge regions would be provided along either edge of the wider strip. Thus, typically to accommodate tolerances in the machinery, wider portions 10a, 10b would be provided along either edge of the wider strip.

Referring to FIG. 1, once the elongate strip has been formed, separate sealing members, designated 20 can be die cut from the strip. Each sealing member is die cut generally centrally from the elongate strip 1 as indicated by the vertical lines 22 in FIG. 4. The sealing member 20 is circular.

The adhesive portion 10a has a straight edge or line 11 which in the illustrated embodiment is straight bounding the gap 16. This line 11 extends approximately diametrically across the sealing member 20, as shown in FIG. 1.

The sealing member 20 thus includes a composite portion 23, and a separated portion 24 with the line 11 running between them. In the composite portion, the wide portion 10a of the first layer of adhesive results in the various layers being bonded together. In the separated portion 24, the laminate sheet 6 is separate and free from the membrane 2. It should be noted that the

sealing member 20 is cut so as to be clear of the narrow portion 10b of the adhesive layer. The narrow portion 10b is included simply to hold the right hand edges of the membrane 2 and the laminate sheet 6 together to prevent them from flapping or becoming folded etc. In known manner, the various dimensions can be chosen so as to maximize the use of the material. Thus, the narrow portion 10b can be kept as narrow as possible, and the width of the strip 1 and the spacing of the sealing members along it can be selected to obtain the maximum number of sealing members 20.

With reference to FIG. 5, a cap for screwing onto a container is shown schematically at 30. The cap 30 is a screw cap, and here is shown as being formed with a uniform wall thickness throughout its planar top wall and cylindrical side wall having a screw thread 34. Within the cap 30, there is a disc 32 of expanded polystyrene or the like, so as to provide a resilient cushioning member. The sealing member 20 is pressed into the cap 30, and is shown in FIG. 5 with the composite and separated portions 23, 24 on the left hand and right hand sides of the figure respectively.

As detailed below, for this usage the membrane 2 is formed from aluminum foil, the first sheet 8 from polyester and the second sheet 14 from paper.

As the sealing member 20 is pressed into the cap 30, the edges of the member 20 will ride over the ridges of the screw thread 34 of the cap 30. The resiliency of the sheet 8 is sufficient to overcome the properties of the membrane 2. The second sheet 14 does not greatly influence the resiliency of the sealing member 20. Consequently, as the edges of the sealing member 20 ride over the ridges 34, the periphery of the first sheet 8 deflects, but tends to spring back to maintain its planar configuration. When the sealing member 20 is fully inserted, as shown in FIG. 5, the composite portion 23 springs back to engage the grooves of the screw thread 34. Similarly, for the separated portion 24, the laminate sheet 6 springs back to engage the grooves of the screw thread. However, the membrane 2, of the separated portion 24 is not bonded to the sheet 8. Consequently, as it rides over the ridges 34 its edge deflects plastically, so as to be permanently deformed. This is indicated at 36. As a consequence, the membrane 2 in the separated portion 24 does not engage the screw threads. However, the engagement by the rest of the sealing member 20 holds the sealing member 20 in position.

The cap 30 is then screwed on to the neck of a bottle, indicated at 40 in FIG. 2 after filling of the bottle or other container. The cap 30 is screwed on sufficiently, to press the sealing member 20 uniformly against the top of the neck 40. The deformed edge 36 is then pressed against the laminate sheet 6 and conforms to the neck of the container. As there is no tab or other feature providing a varying thickness in the sealing member 20, the disk 32 enables a uniform pressure to be applied over the sealing member 20, so that a uniform pressure should be applied at all points between the sealing member 20 and neck 40.

In known manner, the bottle neck 40 with the cap 30 is then passed through an induction heating apparatus. This uses high frequency fields to induce currents within the foil of the membrane 2. This heats the foil 2. The heat in turn causes the hot melt bonding material 4 to melt, and upon cooling it bonds the membrane to the top of the bottle neck 40.

The bottle is then ready for distribution, sale, etc.



In use, to open the bottle, the user removes the screw cap 30 in the usual way. This then reveals the sealing member 20 bonded to the bottle 40. On one side, the laminated sheet 6 of the separated portion 24 forms a free tab 42. On the other side, the composite portion 23 is bonded to the bottle neck 40.

As shown in FIG. 3, the sealing member 20 can then be removed by grasping the tab 42. The tab 42 is grasped between two fingers and pulled in the direction of the arrows 44, i.e. the tab 42 is generally pulled laterally, rather than upwards. The composite portion 23 is then pulled from the bottle neck 40, commencing at the portion remote from the separated portion 24. Further pulling on the tab 42 causes complete detachment of the composite portion 23, followed by detachment of the separated portion 24 as the relative bond strength of the first layer adhesive 10 and the hot melt bonding material or adhesive 4 and the configurations of the adhesive layers 4, 10 are such that the membrane 2 and first sheet 8 are removable as a unit, as shown.

The tab 42 is pulled laterally, to make full use of the bond provided by the first layer of adhesive 10. If the tab 42 is pulled upwards, or away from the separated portion 24, there may be a tendency for the first layer of adhesive 10 to separate, depending upon the nature of the various materials used and bond strengths of the adhesive layers 4, 10. Pulling laterally causes the sealing member 20 to separate from the lip of the bottle neck 40, as a single unit, to leave the neck 40 fully open.

With the bottle open, it can be reclosed if desired, with the cap 30 in known manner.

The preferred materials for the sealing member 20 are as follows. For the membrane 2, aluminium foil having a thickness of 0.0015 inches is used. The hot melt bonding material is adhesive no. H0466 supplied by Industrial Adhesives. The first adhesive layer 10 is a composite adhesive, namely Spenbond adhesive 650/651, supplied by NL Chemicals; adhesive 650 is a water dispersed urethane-laminating adhesive, whilst 651 is a water dispersible curing agent for the adhesive. The first sheet 8 is a polyester, supplied by Dupont, having a thickness of 0.001 inches. The further adhesive layer is adhesive no. R0202, again supplied by Industrial Adhesives, this being a water born adhesive. Finally, the second sheet 14 is a bleached kraft paper having a thickness of 0.004 inches and a nominal weight of 52 pounds.

The top of the second sheet 14, which is formed from paper, is visible once the cap 30 has been removed from a bottle. Accordingly, it can be printed with suitable information. Thus, it can be printed with instructions, including arrows etc. indicating the direction in which the tab 42 is to be pulled. It can be printed with any other information desired, for example trade marks, logos, etc. identifying the product.

A preferred manufacturing sequence for producing the strips is as follows. For sealing members having a diameter of approximately  $1\frac{1}{8}$  inches, a wide strip is produced having a width of  $21\frac{1}{8}$  inches, including ten elongate strips 1. The wide strip is laminated together in the following sequence.

First, the first and second sheets 8, 14 are laminated together. This is achieved by applying adhesive in known manner to one of the sheets and then pressing these two sheets together. This forms the laminated sheet 6. The next step is to dry bond the laminated sheet 6 to the metal foil or membrane 2. This is achieved by applying Spenbond 650/651 adhesive to the laminated sheet 6 (or alternatively to the foil 2), and allowing it to

dry until tacky. The membrane or metal foil 2 is then applied. Heat and pressure are then applied to the composite strip, to re-activate the glue and cause the membrane to become bonded to the laminate sheet 6.

Now, it is necessary for the Spenbond adhesive, forming the first adhesive layer 10 to be only applied in strips. This is achieved by using a specially formed roller. The roller essentially comprises raised parts, of constant radius, and slightly recessed parts. Only the recessed parts contact and transfer glue. A doctor blade wipes the adhesive of the raised parts so that they do not transfer any adhesive. Thus, a sheet passed across the roller receives strips of glue. The roller is so dimensioned as to apply the glue in the desired pattern.

The exposed surface of the membrane or foil 2 is then coated with a hot melt bonding material in the known manner.

The composite, wide strip is then formed. It is slit into the elongate strips 1 and printed. In a preferred embodiment, the wide strip having a width of  $21\frac{1}{8}$  inches is slit into three intermediate strips each including three elongate strips 1, and a separate single elongate strip 1. These three elongate strips and the single elongate strip 1 are then printed, prior to slitting each of the intermediate strips into three elongate strips 1.

In known manner, the various steps are carried out on continuous lengths of the membrane 2 and first and second sheets 8, 14. In general, after each step, the strip formed was rewound, prior to carrying out the next step. However, with suitable equipment, it may well be possible to carry out the various steps as a continuous operation.

Once the elongate strips 1 have been formed, the sealing members 20 are cut from them by die-cutting so that the various layers have a common periphery. The dies are perfectly shaped, to cleanly cut the sealing members 20. Thus, the die is tapered and is deeper on the side for the separated portion 24.

Whilst the above description has been in relation to a circular sealing member 20, it is to be appreciated that many variations of the invention are possible. Thus, the sealing members need not necessarily be circular, but can be a variety of shapes, e.g. a rounded rectangle, depending upon the nature of the container and the shape of its opening. Additionally, the provision of the second sheet 14 and the corresponding layer of adhesive are not always necessary. For some uses, the single sheet 8 of polyester or the like may be suitable. The width of the composite portion 23 can be varied, depending upon the nature of the materials used, the shape of the opening, etc. In any event, the configuration should preferably be such as to ensure that the membrane 2 is always removed completely, rather than being torn and leaving parts of it in place. It is also possible that other combinations of materials could be used, depending upon the application.

Further, the tab free edge need not correspond exactly to the edge of the membrane. Instead, the tab can be made smaller and have various sizes.

The cap used need not be a screw or even a circular cap. It could have plain side walls and a variety of shapes.

The sealing member can be sealed to a container by a variety of different techniques, e.g. a hot plate rather than induction heating. Further, an adhesive that does not require heating could be used.

We claim:

1. A sealing member adapted for securing to a lip around an opening of a container to close the container, the sealing member comprising:

- (a) a membrane having a periphery and a peripheral portion bounded by the periphery, one side of the membrane including first bonding means for bonding the peripheral portion of the membrane to the lip of the container;
- (b) a sheet having a periphery; and
- (c) second bonding means for bonding facing portions of the membrane and the sheet together to form:
  - (i) a lip composite portion for extending over portions of the container lip; and
  - (ii) a central composite portion for extending over portions of the container opening, and leaving at least one portion of the sheet free to form a tab wherein the sheet and the membrane have common peripheral parts in the lip composite portion, wherein the tab is separated from the lip and central composite portions by a boundary, 20 and

with all of the periphery of the sheet overlapping the peripheral portion of the membrane, and wherein the sheet and the membrane are bonded together so strongly by the second bonding means that, in use, the sheet and the membrane can be removed as a unit from the lip of the container to open the container. 25

2. A sealing member as claimed in claim 1, wherein the membrane and the sheet have opposite common peripheral parts in the lip composite portion, and wherein the boundary is generally straight and extends between ends of the opposite common peripheral parts of the sheet and the membrane. 30

3. A sealing member as claimed in claim 2, wherein the lip and central composite portions extend from said boundary to the periphery of the sheet and the membrane, with the sheet and the membrane having a common periphery in the composite portion. 35

4. A sealing member as claimed in claim 2, wherein the boundary extends across a major portion of the sealing member. 40

5. A sealing member as claimed in claim 2, wherein the sealing member has a substantially uniform thickness throughout the peripheral portion.

6. A sealing member adapted for securing to a lip around an opening of a container to close the container, the sealing member comprising:

- (a) a membrane having a periphery, one side of which includes a membrane peripheral portion, which membrane peripheral portion includes first bonding means for bonding to the lip of the container;
- (b) a sheet having a periphery;
- (c) second bonding means for bonding facing portions of the membrane and the sheet together to form a composite portion, whilst leaving at least one portion of the sheet free to form a tab and overlapping the membrane peripheral portion with the tab and the membrane having a substantially common periphery, the composite portion extending up to a boundary separating the composite portion from the tab, the sheet and the membrane having common peripheral parts opposite one another, the composite portion extending from said boundary to ends of the opposite common peripheral parts of the sheet and the membrane, with the common peripheral parts of the sheet and the membrane being within the composite portion, wherein the second bonding means bonds the sheet and the 65

membrane together so strongly that, in use, the sheet and the membrane can be removed as a unit from the lip of the container to open the container.

7. A sealing member as claimed in claim 6, wherein the composite portion extends up to the boundary, which extends across a major portion of the membrane.

8. A sealing member as claimed in claim 7, wherein the boundary is straight.

9. A sealing member having a peripheral portion adapted for securing to a lip around an opening of a container to close the container, the sealing member comprising:

- (a) a membrane having a periphery, one side of the membrane including first bonding means for bonding to the lip of the container;
- (b) a sheet having a periphery;
- (c) second bonding means for bonding facing portions of the membrane and the sheet together to form a composite portion, whilst leaving at least one portion of the sheet free to form a tab, wherein the second bonding means bonds the sheet and the membrane together so strongly that, in use, the sheet and the membrane can be removed as a unit from the lip of the container to open the container, and wherein both the membrane and the sheet extend into the peripheral portion in both the composite portion and the tab, the composite portion and tab being separated by a boundary which extends between ends of common peripheral parts and the composite portion extends from the boundary to the peripheries of the sheet and the membrane, with the sheet and the membrane having a common periphery within the composite portion. 40

10. A sealing member as claimed in claim 9, wherein, in the composite portion, the sheet and the membrane have common peripheral parts opposite one another.

11. A sealing member as claimed in claim 10, wherein the composite portion and tab are separated by the boundary which extends across a major portion of the membrane.

12. A sealing member as claimed in claim 11, wherein the boundary is straight.

13. A sealing member adapted for securing to a lip around an opening of a container to close the container, the sealing member comprising:

- (a) a membrane having a periphery, one side of the membrane including first bonding means for bonding to the lip of a container;
- (b) a sheet having a periphery;
- (c) second bonding means for bonding facing portions of the membrane and the sheet together to form a composite portion, and leaving at least one portion of the sheet free to form a tab, wherein the second bonding means bonds the sheet and the membrane together so strongly that, in use, the sheet and the membrane can be removed as a unit from the lip of a container to open the container, a boundary being formed between the composite portion and the tab and the composite portion extending from the boundary to the peripheries of the sheet and the membrane, with the sheet and membrane having a common periphery in the composite portion, and wherein, in the tab, the sheet has a periphery at least part of which overlies the periphery of the membrane.

14. A sealing member as claimed in claim 13, wherein the second bonding means extends up to the boundary, which extends across a major portion of the membrane.

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15. A sealing member as claimed in claim 14, wherein the composite portion covers a substantial part of the membrane.

16. A sealing member as claimed in claim 15, wherein the sheet and the membrane have common peripheral parts opposite one another.

17. A sealing member as claimed in claim 16, wherein the boundary is straight, and the common peripheral parts are continuous with the boundary.

18. A sealing member as claimed in claim 17, wherein the sheet and the membrane have an entirely common periphery.

19. A sealing member as claimed in claim 1, 2, 6, 8, 9, 12, 13 or 17, wherein the first bonding means of adhesive comprises a hot melt bonding material.

20. A sealing member as claimed in claim 19, wherein the membrane is formed from a metal foil, whereby, in use, it can be heated by induction heating, to melt the hot melt bonding material.

21. A sealing member adapted for securing to a lip around an opening of a container, the sealing member comprising:

(a) a membrane having a periphery, one side of the membrane including first bonding means for bonding the membrane to the lip of the container;

(b) a sheet having a periphery;

(c) second bonding means between the membrane and the sheet bonding facing portions of the membrane and the sheet together to form a composite portion, and leaving at least one portion of the sheet free to form a tab, a boundary extending between peripheries of the sheet and membrane at each end of the boundary, the sheet and membrane having common peripheries at least at the ends of the boundary and in the composite portion, and the tab having a periphery at least part of which overlies the periphery of the membrane, wherein the

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sheet and the membrane are bonded together so strongly by the second bonding means that, in use, the sheet and the membrane can be removed as a unit from the lip of the container to open the container.

22. A sealing member as claimed in claim 21, wherein the boundary extends across a major portion of the membrane.

23. A sealing member as claimed in claim 1 or 2, in combination with a container including a planar lip, the sealing member being secured to the lip around an opening of the container, to close the container, wherein the whole of the sealing member is generally planar.

24. A sealing member as claimed in claim 6 or 21, in combination with a container including a planar lip, wherein the membrane is bonded by the first bonding means to the lip of the container and wherein the sealing member is generally planar.

25. A sealing member as claimed in claim 1, wherein the lip composite portion is arcuate, has an arcuate periphery and extends around the central composite portion and between ends of the boundary.

26. A sealing member as claimed in claim 1, wherein the lip composite portion is curvilinear, has a curvilinear periphery and extends around the central composite portion and between ends of the boundary.

27. A sealing member as claimed in claim 9, wherein the sealing member generally has a uniform thickness throughout the peripheral portion.

28. A sealing member as claimed in claim 13, in combination with a container wherein the whole of the sealing member is generally planar.

29. A sealing member as claimed in claim 21, wherein the boundary is generally straight and extends between the tab and the composite portion.

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